Leaf miners—

Topborer first larvae—*Topeutis intacta* Snell.

Midrib miner—*Cosmopteryx dulcivora* Meyrick.

Moth blade miner—*Cosmopteryx pallifasciella* Sn.

Beetle blade miner—*Monochirus callicanthus* Bates.

Leaf eaters—

Army worms—*Spodoptera mauritia* Boisd., *Cirphis loreyi* Dup.

Leaf rollers—*Marasmia trapezalis* Gn., *Padraona dara* Koll.

Leaf worms—*Cyllo leda* L., *Dinara combusta* Moore, *Laelia suffusa* Walker, *Mycalesis mineus* L., *Parnara matthias* Fabricius, *Prodenia litura* Fabricius, *Utetheisa pulchella* L.

Many grasshoppers.

This list is only partial, as many injurious species are as yet undetermined. The majority of the determined species are recorded from Java, some from India, Australia, and other oriental countries. I have omitted the long list of beneficial insects.

DEPREDATIONS TO LEAD-COVERED AERIAL CABLES BY BEETLES IN BRAZIL.

By E. J. P. Rendell,
Emprezas Electricas Brasileiras, S. A., Rio de Janeiro.[1]

Cases of damage to aerial telephone cables by lead boring insects have been reported from such varied parts of the world, as China, Australia and California—these matters have been

[1]The present paper presents a unique case of insect damage to metal. The species studied in this country, a Bostrichid, *Scobicia declivis* Lec., attacks lead sheathed aerial cables in the adult stage, apparently stimulated in its attack by the contact stimulus, since most of the attack is at the point of contact of the cable and the ring which supports it. Injury has been prevented by changing the character of the ring cable and thus preventing the insect from propping itself in order to facilitate boring. Soft beef tallow placed on the cable will also prevent attack.

Apparently all damage to metal by insects is accidental. The insects either emerge from wood and continue to bore through metal which is in contact with the wood or haphazardly attack metal, being stimulated by some tropism. We believe that in the present case it can be likened to that of a female moth in captivity, laying her eggs by necessity on whatever object chances to be nearby, and it might be that the female beetle being full of eggs lays a few on the lead sheath cables, preserving the greater supply for the normal wood host plant.

Dr. L. O. Howard has handed me the first reference to a larva boring in lead which is as follows: Schirch, P. F., Un insecto que fura canos de chumbo, Bul. Nat. Mus. Brazil, vol. V, no. 3, p. 97–8, figs. 6, September, 1929. Rio de Janerio.

May 16, '30. Thos. E. Snyder.

investigated by Government scientists whose findings are set forth in a bulletin issued by the Department of Agriculture, Washington, D. C.[1]

Lead boring trouble exists in Brazil, and recognizing the extent and importance of the work already done by Dr. Thomas E. Snyder and his associates in Washington, Mr. Paul B. McKee, General Manager Emprezas Electricas Brasileiras, S. A., commissioned the writer to co-ordinate all information which could be collected from the associated telephone companies operating in Brazil, for report to Dr. Snyder.

Amongst others—the operating engineers in the States of Pernambuco, Bahia and Espirito Santo, all report lead boring trouble, but as information to date is complete only in respect of Pernambuco, this history will deal principally with the investigations made on the Pernambuco beetle, *Megaderus stigma* L. Cerambycidae.

The Telephone Company of Pernambuco serving the automatic system of Recife has an aerial cable network of approximately 100 kilometers. The cables, varying in size from 10 to 200 pairs, are of standard dry core specification, plain lead sheath composed of 99% pure lead and 1% antimony. The cables are supported over the network with "Bonita" rings on steel suspender attached to steel poles.

The cables in the affected area, with a length of approximately 18.6 kilometers, were erected July–December, 1927. They were tested O. K. on air pressure and for insulation in January, 1928. In February, 1928, reports of low insulation were received, and the attempt to dry out by pumping dessicated air into the cables, disclosed the existence of small broadly oval shaped holes, approximately 1 mm. long, penetrating the upper half of the lead cable sheath;—the trouble recurred continuously in this area until June, 1928, when the reports ceased for that year. In February, 1929, however, more cases of cable breakdown were reported, and these continued until the month of July, 1929, after which no further trouble was experienced up to March, 1930.

Sometimes the cable breakdown would be caused by one hole only, but as many as 100 holes have been located in one 88-meter length of cable—80 of these holes were discovered in one 40-meter span—in all cases the dessicating pump proved to be invaluable in speedily locating the presence and position of the holes in the lead sheath.

It was observed that the holes appeared over the whole length of cable, irrespective of the position in the span or of

[1]1923. Burke, H. E., Hartman, R. D., and Snyder, T. E., The lead-cable borer or "short-circuit beetle" in California, U. S. Dept. Agric. Bul. 1107. (Professional paper.)

cable rings or other supports;—the holes are always in a 45° sector on either side of the center in the upper half of the sheath—the boring is however generally not radial, indicating an attempt at tunnelling.

Close examination of other materials adjacent to the cable was made by the Lines Engineer, Mr. Seeley, who eventually discovered identical holes in cross arms of "Sucupira" wood. He also observed several small shell-like objects in clusters on the wood cross-arms, which could be removed by a slight touch—in some instances disclosing a white substance. Mr. Seeley afterwards observed similar objects on the cable sheath and after much patient watching he was rewarded by the capture of a beetle on the cable. It was subsequently found that these shell-like objects were really eggs, deposited by the beetle "*Megaderus stigma*," known colloquially in Recife as the "Carocha," a wood-boring beetle about one inch to 1½ inches long. The matter had been fully reported to Mr. Berry, Chief Engineer, and he, together with Mr. Seeley, commenced a series of observations on the bad habits of the "*Megaderus stigma*" family. It will of course be appreciated that the activities of "*Madame Meg*" during the egg season made it difficult for the observers to maintain 100% observations—which consequently were of necessity extended over a considerable period.

Several of the beetles were collected and placed inside a metal box with a glass top—pieces of lead cable were put inside the box and very soon eggs were deposited thereon.

In the first observation the box and contents was left on a table in a room, but after several weeks as no result was obtained the observation was abandoned.

Later more beetles were placed in the same box—but in this instance the conductors were withdrawn from the sheath and the ends sealed. Eggs were again deposited on the sheath which was then placed outside in similar conditions to the cable in the network.

In six days holes were found in the lead, empty shells noticed over some holes and around others minute lead borings were visible. Some of the eggs were lying on the sheath, having the same appearance as when deposited.

After a further period of 14 days more holes were discovered in the lead sheath, and the sheath was then opened.

No trace of any object of any description was discovered inside the sealed sheath. These observations extended to July, 1929—and by that date the beetles having disappeared no more eggs could be obtained. Summarizing the results of these observations Mr. Berry states:

(a) The insect is the *Megaderus stigma*, L. (Cerambycidae),

(b) The hole is bored by the larvae and not by the full grown insect,
(c) The egg can develop and a hole be bored in the lead sheath in 6 days,
(d) Apparently the limit of damage directly accomplished by the borer is the boring of the lead sheath. The insulation of the cable is not damaged by the insect but by the moisture which passes through the hole,
(e) There is a tendency to tunnel on the part of the insect.

It was felt that some confirmation of Mr. Berry's conclusions was desirable, particularly as the larvae had not been seen by the observers and the writer arranged for a consignment of live male and female beetles to be despatched by airmail to Dr. Raymond C. Shannon, who is at present residing in Bahia.

A full report of the observations made in Pernambuco, and a consignment of live beetles were also sent to Doctor Carlos Moreira, Director of the Instituto Biologico, Rio de Janeiro. Dr. Moreira is keenly interested in the lead-boring problem and he is taking steps to advance these investigations, the result of which will undoubtedly take the form of a separate and most interesting report. In the meantime, Doctor Shannon has arrived at some conclusions and the following is a verbatim account of his report on his findings:

Some observations on the Lead Boring Beetles, March 4th to March 13th, 1930.

A shipment of beetles, received from Recife March 4th, consisted of a wooden box, the top being sealed with a fine mesh copper screening, and contained 10 living male and female beetles *Megaderus stigma*, L. (Cerambycidae), and an eight-inch piece of lead pipe.

The following observations were made:

1. Incubation period of the eggs—minimum, 4 days; maximum, more than 9 days.
2. Of the 27 eggs which had been deposited on the lead, 7 of the larvae upon hatching succeeded in boring through the lead; 12 attempted to do so but gave it up and crawled out of a hole made on the free side of the egg and fell to the bottom of the container; the rest apparently died before hatching.
3. The boring is accomplished by chewing the hole with the jaws, i.e., it is a mechanical and not a chemical action.
4. Little if any of the lead is ingested (therefore the boring larvae are not poisoned by the metal).
5. Free larvae (those lying loose on the bottom of the container) when placed in a damp cardboard box were unable to bore into the cardboard.
6. Larvae hatching from the eggs laid on the fine mesh copper screening of the top of the box, made little or no attempt to bore; possibly the copper is too resistant.

7. Larvae succeeding in boring through the lead cable doubtlessly die shortly afterwards owing to lack of food and water.
8. The larvae upon hatching are small (about 2 mm. in length) grub-like, creamy yellow in color and entirely soft, save for their strongly sclerotized cutting jaws.
9. The mandible is flat, the basal attachment being very broad, while the anterior or outer edge is developed into a sharp blade-like structure, which resembles the curved edge of a circular blade. Below the blade-like structure is a more or less distinctly separated gouge-like organ, pointed at the apex and with a hollow between two lateral sharp edges. Presumably the blade-like structure of the main part of the mandible is pressed into the lead, forming a groove, while the attached gouge-shaped structure is used in chipping off the lead along the sides of the groove.
10. The lead is ejected from the boring by a twisting, backward movement of the larva. As a piece of the lead is removed by the mandibles, the labium holds it in position, while the larva twists its body so as to free its head in order to carry the bit of metal to the opening of the boring. This is piled into the egg case, and as it is filled, the shavings begin to fall out of the (sometimes two) opening which has been previously made on the free side of the egg shell.
11. The various dimensions are:

    Egg: 1½ mm.

    Larva (first stage) approximately 2 mm.

    Adult beetle from 30 to 40 mm.

    The appearance of the larva and adult beetle *Megaderus stigma* is illustrated in attached drawing.

The following life story is also from the pen of Dr. Shannon:

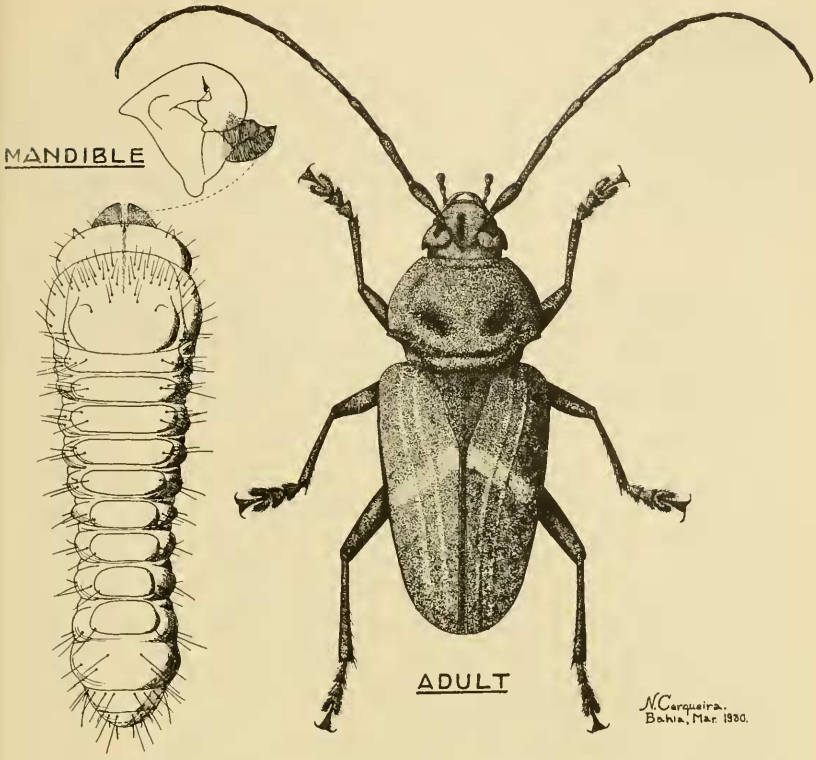
The Probable Life-History of the Beetle in its Normal Habitat.

The proper food material of the larvae undoubtedly is wood. The fact that the beetles sometimes lay their eggs on metal surfaces, indicates nothing more than a mere accident (as far as the beetle is concerned). It would be of interest and probably of importance to ascertain the preferred type of wood, especially whether it is a living tree or dead and dry timber (very probably the latter).

The egg requires at least four days to hatch but may remain unhatched for more than nine days.

The larva upon hatching immediately bores into the surface to which the egg is attached, using the egg shell as a support or brace until it is well within its gallery. In its natural habitat (wood) it probably retains the larvae stage for six months to nearly a year. After the larvae attains its growth, it transforms into the pupa (probably only one or two weeks is required for this stage) and finally, upon the arrival of the proper season for the adults, they, the adults, make their exit from the wood.

The proper season for the adults probably corresponds more or less to the summer season. The length of life of an individual adult may be from one to three months.



MEGADERUS STIGMA L
CERAMBYCIDAE

The length of life per individual (all stages, egg, larva, pupa and adult) probably approximates a year's time, therefore there should be but one brood per year. No estimate can be given as to the number of eggs produced by a single female, but possibly it is between 100 and 200.

Recently (March, 1930), in Pernambuco, in company with Messrs. Seeley and Kelly, I found old lumber in one of the lumber yards (evidently which had been stored there for a year or more) with numerous holes, very similar in appearance to those made by larvae in wood and lead kept under laboratory conditions.

Time did not permit a more thorough examination of the wood, but it would thus appear that possibly the lumber yards may be suspected as a source of the beetles.

It should be understood, however, that another, but very much smaller species of beetle is to be found in great abundance in lumber yards, and they

too make holes very similar in size and shape to those made by the larva the "*Megaderus stigma*."

This small insect is commonly known as the Powder-Post beetle and its presence may be surmised by the presence of fine flour-like wood dust resulting from their borings.

Mr. Seeley showed me a nearby section of the city, wherein damage to the cables was particularly severe, and suggested that the odor arising from several sugar factories located here, attracted the beetles to this immediate vicinity.

(*Signed*) RAYMOND C. SHANNON.

From my own personal observations and also from reports received from other States in Brazil—namely Bahia, Alagôas and São Paulo—I can confirm that the areas affected by the depredations of the beetles, generally contain armazens for sugar, wine or spirit, or some odorous food which attract the beetles to those locations.

On March 31st, 1930, with Dr. Shannon and Mr. G. Lopes, the writer visited the lumber yard "Xixi" Rua Pilar in the affected area Bahia. Much of the timber had the small holes but usually they were accompanied by the presence of the wood dust made by the borings of the powder-post beetles. However, below one plank there were found several small cone-shaped piles of sawdust and this was examined. Three large size galleries were found and in each of them was found the larva[1] of a Cerambycid beetle. One of the larvae was well over an inch in length, the other two were little more than half an inch long. It can not here be stated that they are actually the *Megaderus stigma*, but the presence of larvae belonging to this group of beetles in the timber yards is of sufficient importance to place the yards under suspicion.

It appears that the lumber arrives from the interior with the larvae already in the wood, as the plank in question had been in the yard approximately two months and owing to shipping delays it had taken about three months to arrive from Caravellas (south of the State of Bahia) to the Port of Bahia (São Salvador). Similar entrance holes were found in wine casks stored in a wine shop and from the statement of the dealer it appears these borings occur with frequency in this district, his attention being drawn to these holes by the leakage of wine. Again, there is a possibility that these holes are made by the powder-post beetle. No adult beetles of *Megaderus stigma* have been found in Bahia during the course of this investigation.

It may be of interest to state that in one area, outside the sphere of operations of the Emprezas Electricas Brasileiras,

[1]Subsequent examination of these larvae by Dr. F. C. Craighead proved that they are not even closely related to *Megaderus* and therefore not concerned in the lead cable injury.

it is reported that a cure has been effected by wrapping the plain lead sheath with white cotton tape—the tape being afterwards painted with a red oxide paint. It is probable that a serving of tarred jute over the lead sheath would also afford protection from the larvae and in addition would doubtless make the cable distasteful to the female beetle. On the other hand, if the misguided females could all be tempted to lay their eggs on lead instead of wood, the race would become extinct.

In view of the extended use of aerial lead-covered cable all over the world it is hoped that these notes will stimulate further interest in the problem before us. Much can be done by cooperation and interchange of experiences and by pooling our ideas it may yet be possible to restrict the destructiveness of the *Megaderus stigma* to their natural wood-boring habits.

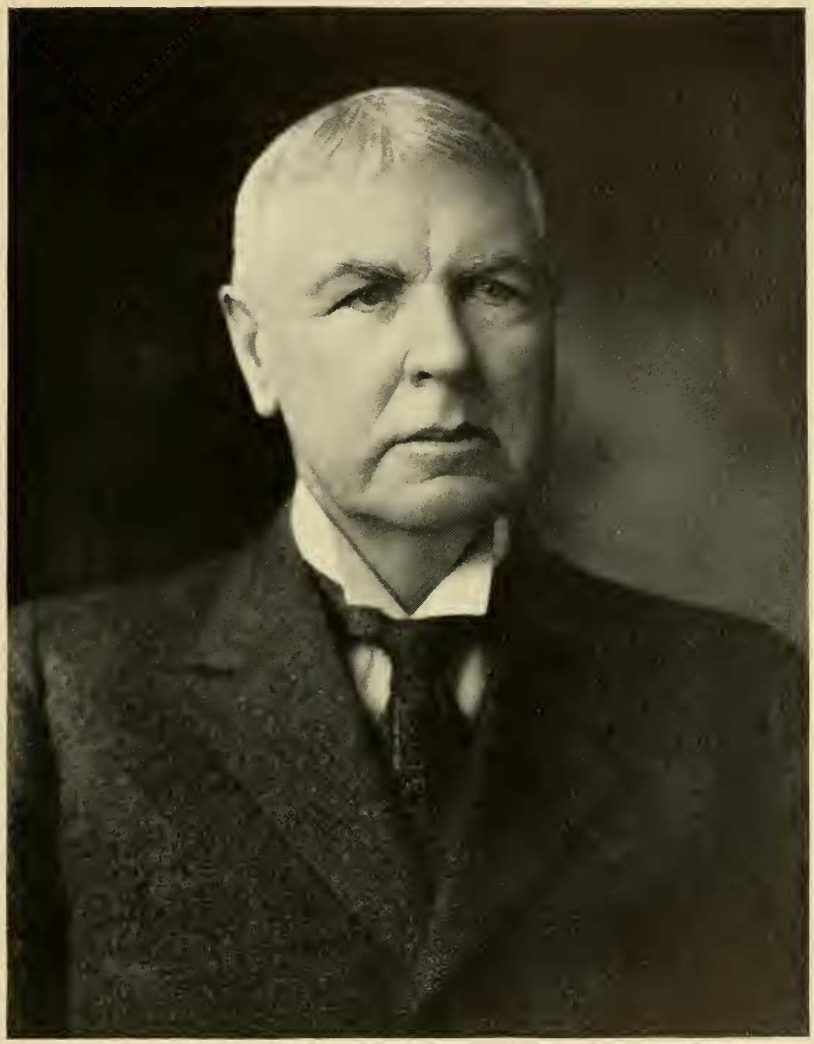
WILLIAM BARNES.[1]

On May first, after a protracted illness, Dr. William Barnes died. His passing closes an important chapter in American Entomology and ends a varied and interesting career. William Barnes was a rare man, distinguished as a surgeon, eminent as a citizen and public benefactor, first among American Lepidopterists and unsurpassed as a host and friend. His entire life—except for the time passed at college and in traveling—was spent in Decatur, Illinois. There he was born on September 3, 1860. There he was graduated in 1877 from the Decatur High School. There, after graduation from Harvard University (1883) and Harvard Medical School (1886) and after a postgraduate medical study in Germany, he returned to begin his career as a surgeon, to carry on his researches in American Lepidoptera and to bring together the great collection that bears his name and that is generally conceded to be the largest, finest, most complete, and most accurately determined collection of American Lepidoptera in the world.[2] If Dr. Barnes had done nothing but assemble this collection, he would have done a great work, but he did much more. He employed specialists to work on his collection and made it free of access to any responsible worker. During his lifetime Decatur was an Entomological center, a rallying point for Lepidopterists, where hospitality was open and "indoor collecting" of the best. He gave material freely to other Museums and collectors. He published extensively. The copiously illustrated "Contributions to the Natural History of the North American Lepidoptera," embodying the researches of himself and his collaborators and consisting of extensive descriptive and revisionary papers, is an important addition to Entomological literature. He was active in civic affairs and a tireless worker for any project, institution, or cause that would benefit his community. He was one of the founders and supporters of the Decatur and Macon County Hospital at Decatur, and a guiding spirit in that institution until his death. He enjoyed good living, appreciated good books, and despised hypocrites and frauds. Working under him was, as Foster H. Benjamin once remarked, "like taking a postgraduate course. You really began to make fewer mistakes." With his passing, Entomology loses a master worker and a princely patron, our society a valued member, and we, who knew him intimately, a rare and steadfast friend.

[1]Prepared at the request of the Society by William Schaus, August Busck, and Carl Heinrich.

[2]As this goes to press, we learn that this magnificent collection has been secured through act of Congress by the U. S. Bureau of Entomology and will be deposited in the U. S. National Museum.

Actual date of publication, August 29, 1930



WILLIAM BARNES.